

# 3<sup>RD</sup> INTERNATIONAL RED SEA EMERGENCY MEDICINE CONFERENCE



# Extreme Obesity: Clinical Challenges

Joanne Williams, MD, MAAEM, FAAEM  
Associate Professor of Clinical Emergency Medicine  
Charles R. Drew University of Medicine and Science  
Los Angeles, California USA

NO DISCLOSURES

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# Objectives

At the end of the presentation, each participant will be able to:

- Describe the current classification of obesity
- Discuss the severity of the global epidemic of obesity
- Grasp the diagnostic and treatment challenges in the extremely obese patient



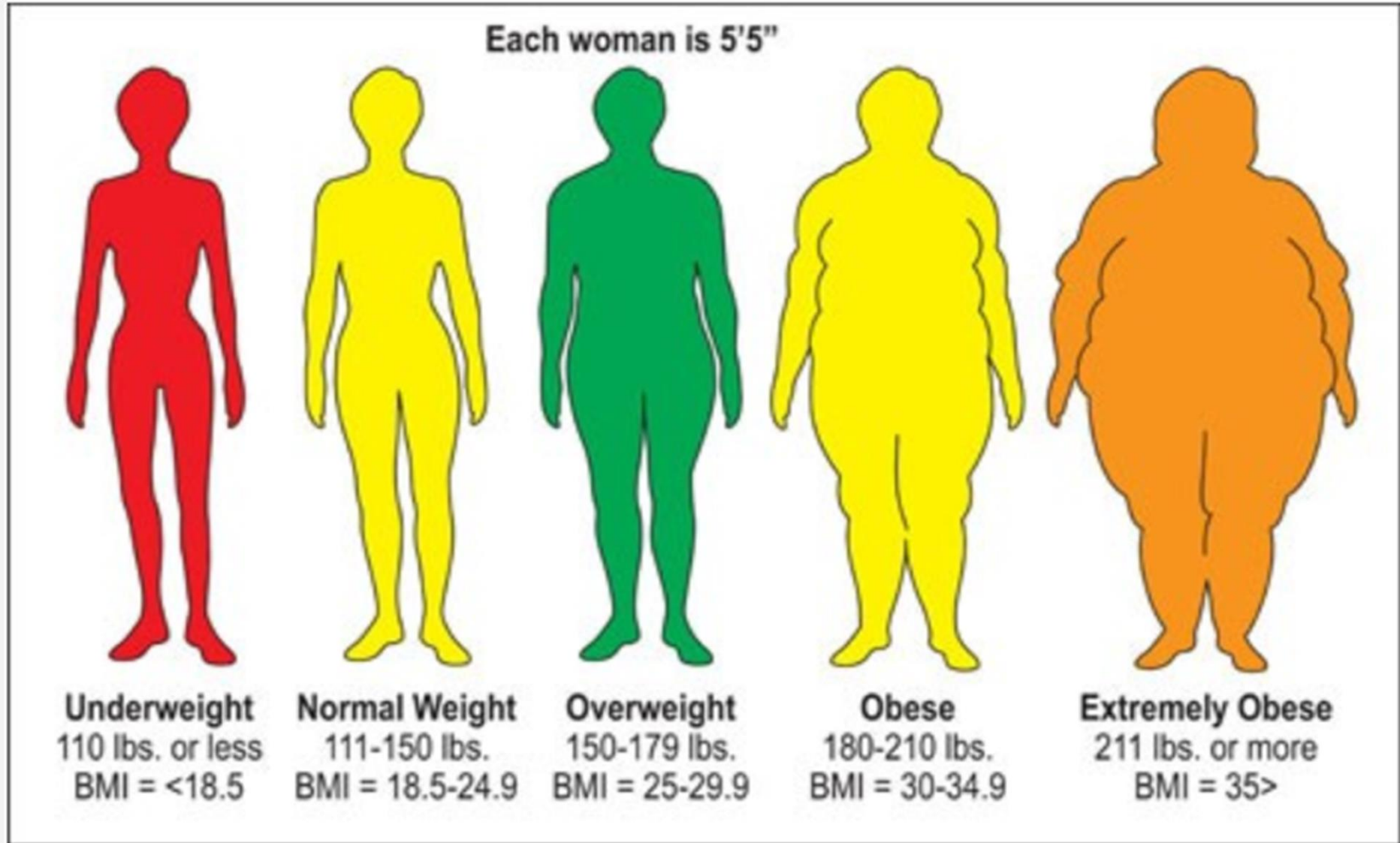
# CLASSIFICATION OF OVERWEIGHT AND OBESITY BY BMI<sup>1</sup>

| Obesity Class |     | BMI (kg/m <sup>2</sup> )* |
|---------------|-----|---------------------------|
| Underweight   |     | <18.5                     |
| Normal        |     | 18.5 – 24.9               |
| Overweight    |     | 25.0 – 29.9               |
| Obesity       | I   | 30.0 – 34.9               |
|               | II  | 35.0 – 39.9               |
|               | III | ≥40                       |

\*To estimate BMI using pounds and inches, use:  $[\text{weight (pounds)} / \text{height (inches)}^2] \times 703$ .

Waist circumference and BMI are inter-related but waist circumference provides an independent prediction of risk over and above that of BMI.





BMI – Feet and Pounds

# OBESITY IS NOW A GLOBAL EPIDEMIC!



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# THE NUMBERS<sup>2</sup>

- The number of obese people in the total world is approximately 2.1 billion, which makes up about 30% of the total population.
- This number continues to rise. Over 3 million people each year die from obesity related illnesses.
- The worldwide obesity rate has tripled since 1975.
- 36.20% of the US population is obese.





# HEALTH RISKS ASSOCIATED WITH OBESITY

- Mortality
- Hypertension
- Dyslipidemia
- Type 2 diabetes
- CAD/ACS
- Stroke
- Gallbladder disease
- Osteoarthritis
- Obstructive sleep apnea and hypoventilation of obesity
- Cancers
- Low quality of life<sup>3-5</sup>

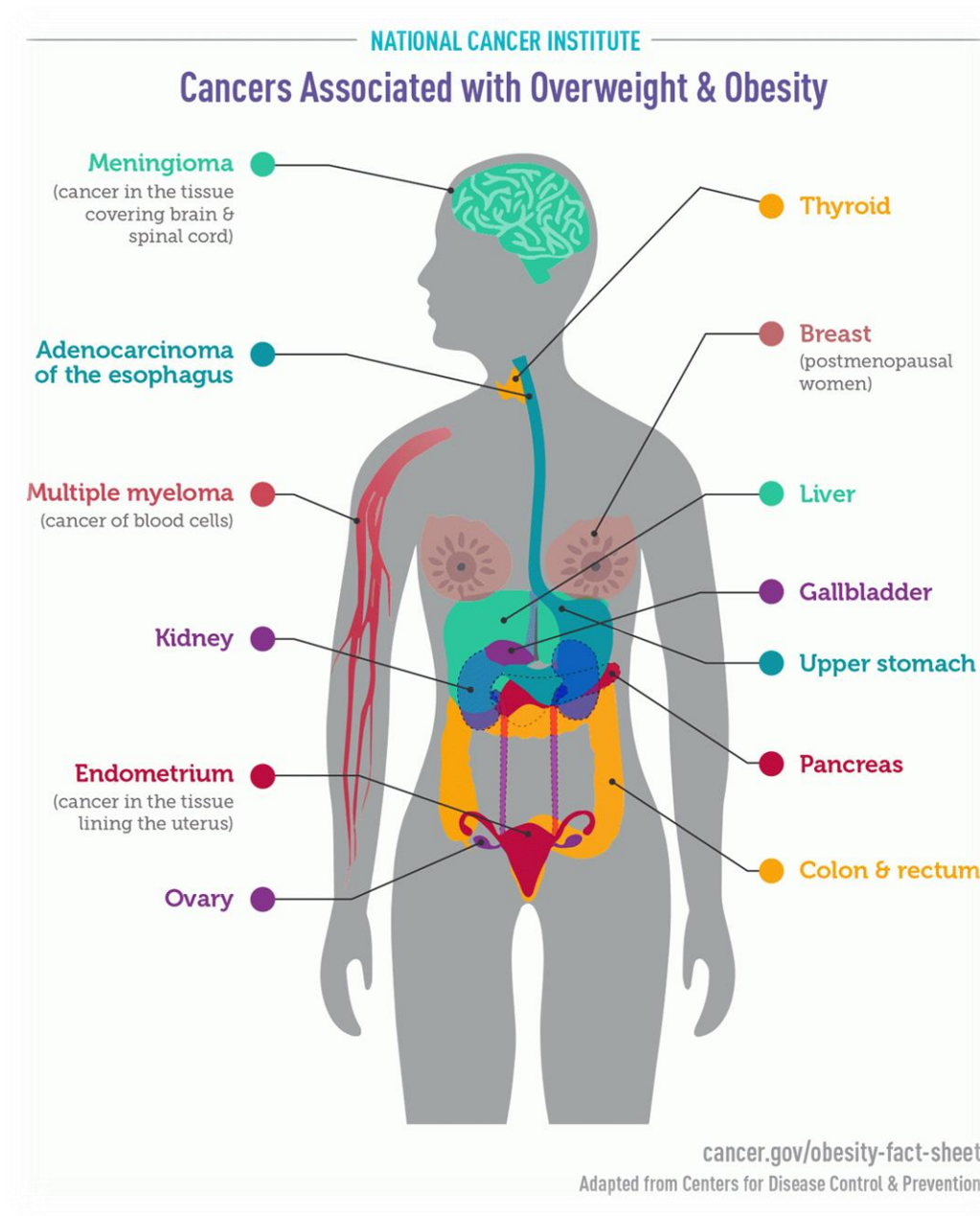


# HEALTH RISKS ASSOCIATED WITH OBESITY

- Mental illness such as clinical depression, anxiety, and other mental disorders<sup>6,7</sup>
- Body pain and difficulty with physical functioning<sup>8</sup>







# TRAUMA IN EXTREME OBESITY



# TRAUMA IN EXTREME OBESITY

- In children and adults, obesity has been shown to be associated with a higher rate of overall injuries.<sup>9,10</sup>
- Individuals with sleep apnea had a sevenfold risk for motor vehicle accidents.<sup>11</sup>
- Obese victims of MVAs (BMI >31) have significantly more rib fractures, pelvic fractures, pulmonary contusions and extremity fractures and fewer head and liver injuries.<sup>12</sup>
- Mildly overweight patients, not the morbidly/extremely obese, are less prone to intra-abdominal injury, because of the protective effect of the abdominal fat, known as the “cushion effect”.<sup>13</sup>





# ED CHALLENGES IN TREATING THE EXTREMELY OBESE

“When you can’t do what you need to do because you can’t get to where you need to be!”





# ED CHALLENGES IN TREATING THE EXTREMELY OBESE

- Unfortunately, the risk of death from all causes of critical illness increases throughout the range of moderate and severe overweight in both men and women in all age groups.<sup>14</sup>
- Because the concern for equipment weight capacity in the adult obese patient is crucial, close approximation of weight in this population is crucial. Scales in most Emergency Departments have a maximum weight capacity of 150kg.

# ESTIMATING WEIGHT<sup>15</sup>

## Non-Pregnant Females

$$\text{Weight} = 64.6 + 2.15 (\text{arm circumference in cm}) + 0.54 (\text{height in cm})$$

## Males

$$\text{Weight} = 93.2 + 3.29 (\text{arm circumference in cm}) + 0.43 (\text{height in cm})$$





# DRUGS<sup>16</sup>

| DOSING | DRUGS                                                                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IBW    | Penicillins, cephalosporins, linezolid, corticosteroids, H2-blockers, digoxin, beta-blockers, atracurium, vecuronium, *fentanyl, *midazolam, *lorazepam, phenytoin, propofol |
| TBW    | Succinylcholine, rocuronium, unfractionated heparin, enoxaparin, vancomycin,                                                                                                 |
| DW     | Aminoglycosides, fluoroquinolones                                                                                                                                            |

\*Initial dosage based on TBW

$$\text{Dosing Weight} = \text{IBW} + (0.4 * (\text{Actual Weight} - \text{IBW}))$$

\* Correction factor is 0.4 for aminoglycosides

# DRUGS

- Fentanyl and the benzodiazepines are lipophilic and have a prolonged half-life in obese patients.
  - With these drugs, the initial dose based on TBW may be needed but subsequent doses should be based in IBW.<sup>17</sup>
- Because obese patients have preexisting respiratory compromise, procedural sedation drugs and pain medications should be given cautiously. Lower doses are advised and titrated to effect.
- Local and regional anesthesia might be considered for complicated or prolonged procedures.<sup>18</sup>



# AIRWAY

- Difficulty with mask ventilation
- Rapid oxygen desaturation
  - Hypoventilation of obesity
- Altered pharmacokinetics can make airway management in the obese patient problematic
- Impedance to airway management
  - Excess fatty tissue
    - Externally on the breast, neck, thoracic wall and abdomen and
    - Internally in the mouth, pharynx and abdomen





# AIRWAY

The respiratory compromise that is associated with extreme obesity leaves little time for error!





# AIRWAY

## Aspiration Prone

- Obese patients have increased intraabdominal pressure
- Increased incidence of hiatal hernia and gastroesophageal reflux disease<sup>19</sup>



# AIRWAY

## Desaturation

- Obese patients will desaturate more rapidly after preoxygenation than their lean counterparts.
- When no C-spine injury is suspected, this desaturation may be partially prevented by keeping the patient in a 25° head-up position during preoxygenation.<sup>20</sup>





# AIRWAY

## “Sniffing Position”

- The “sniffing” position results in suboptimal positioning for laryngoscopy in an obese patient, and this may also confound results and falsely worsen graded views. <sup>21</sup>



# AIRWAY

## Ramping Position

- The “ramping” position offers improved intubation conditions in the morbidly obese compared to the “sniffing” position.<sup>22</sup>





# AIRWAY

## RSI

- Obesity is not a contraindication for rapid sequence intubation.
- Advance preparation is critical and assessment for a potential difficult airway is of utmost importance!
- Continuous O<sub>2</sub> via nasal cannula is advised throughout the procedure.





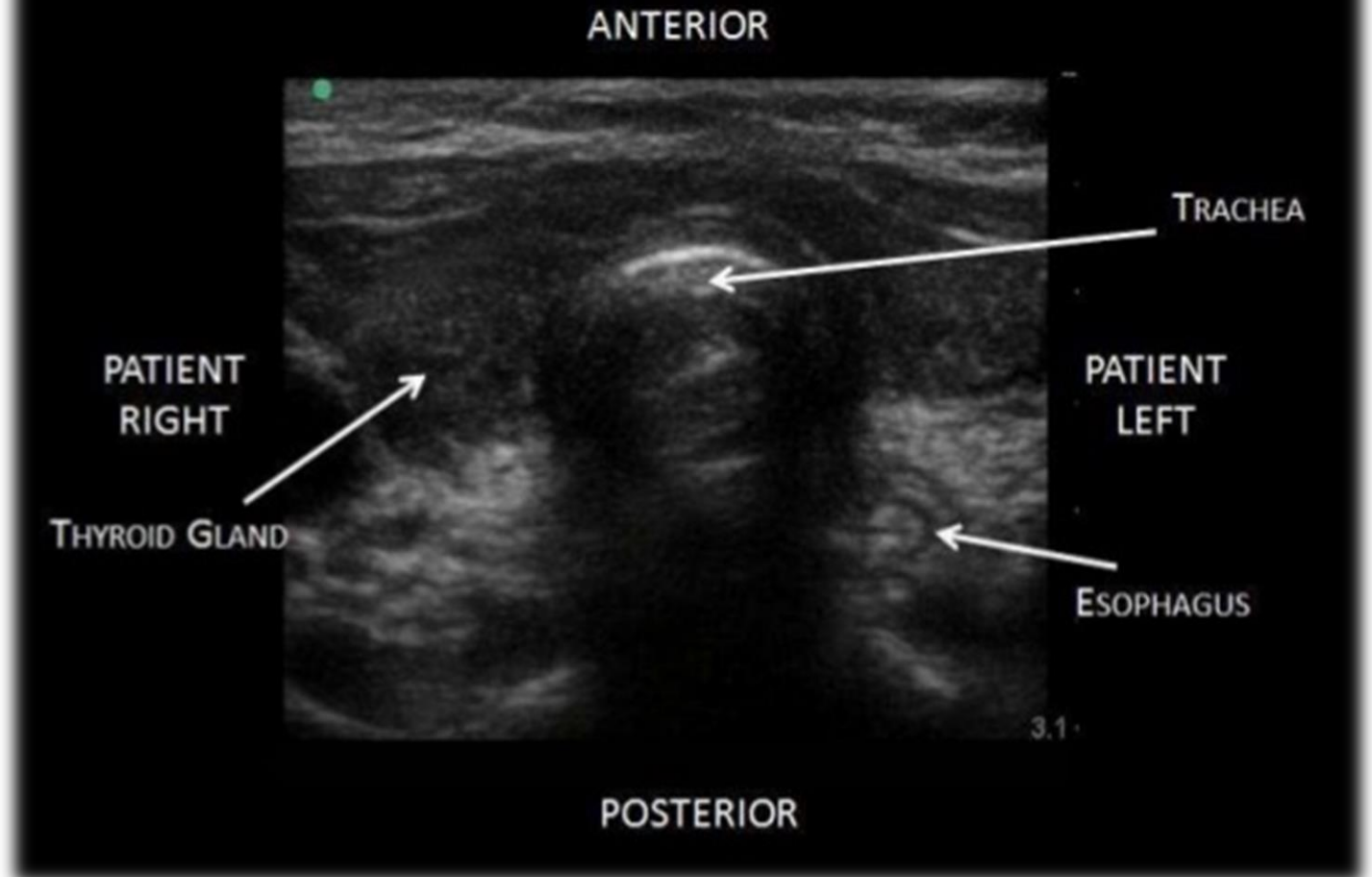
# AIRWAY

## Desaturation During RSI<sup>23</sup>

- The mean Safe Apnea Time (95% CI) was 283 (257–309) s in succinylcholine vs. 329 (303–356) s in rocuronium (P = 0.01).
- The mean recovery period (95% CI) was 43 (39–48) s in succinylcholine vs. 36 (33–38) s in rocuronium.

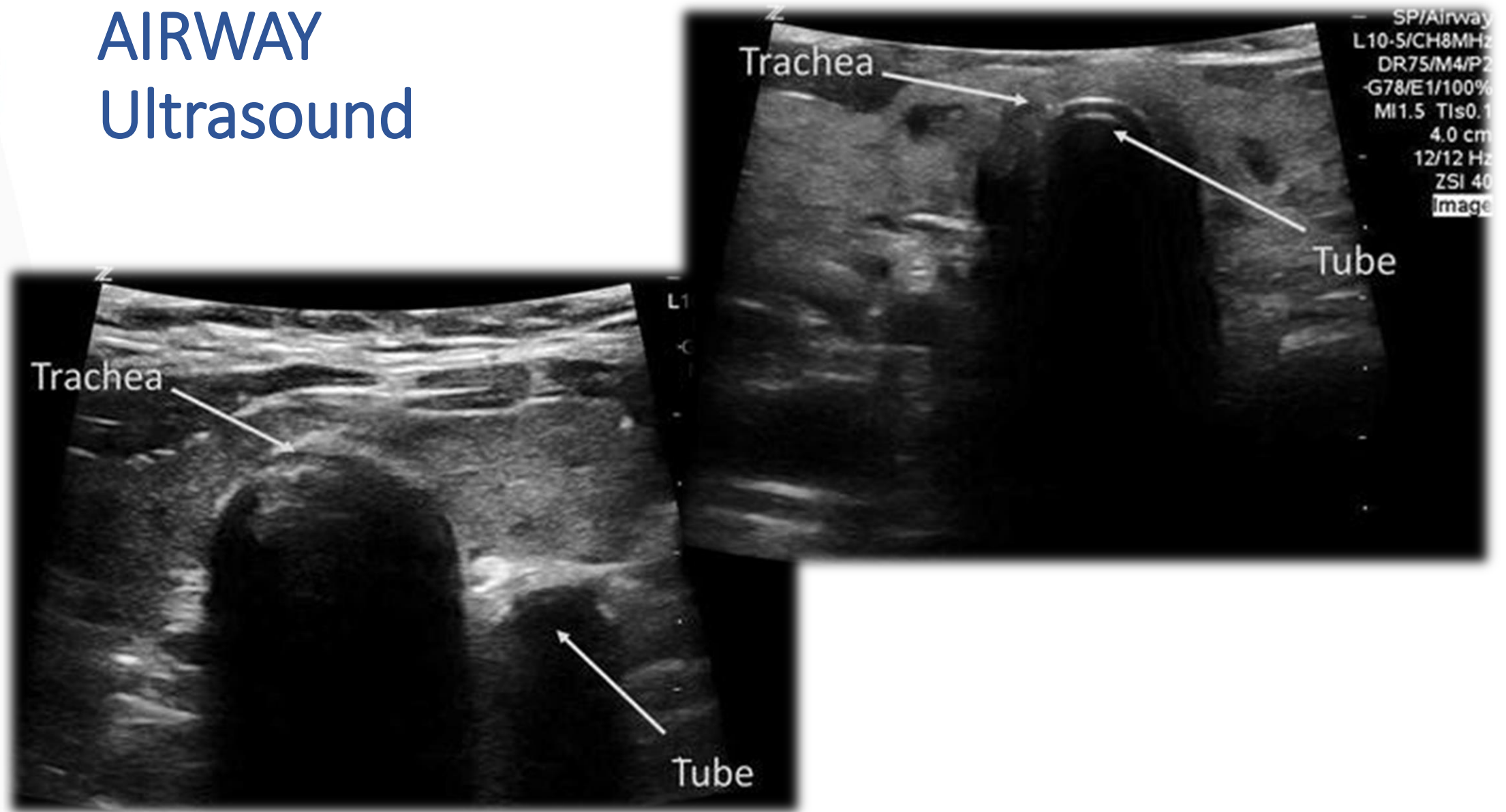
# AIRWAY Ultrasound

## Direct: US Anatomy





# AIRWAY Ultrasound

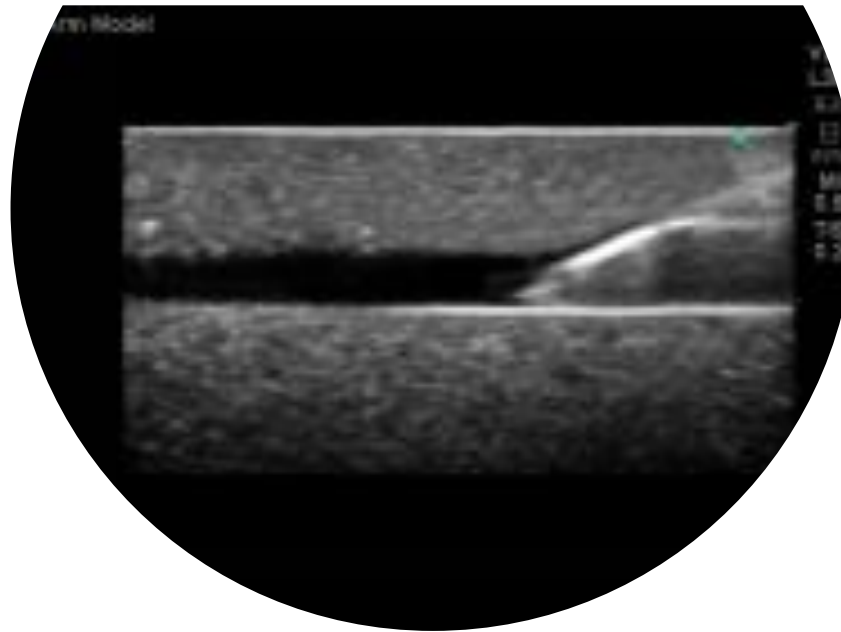


My go to for the breathing extremely obese patient!



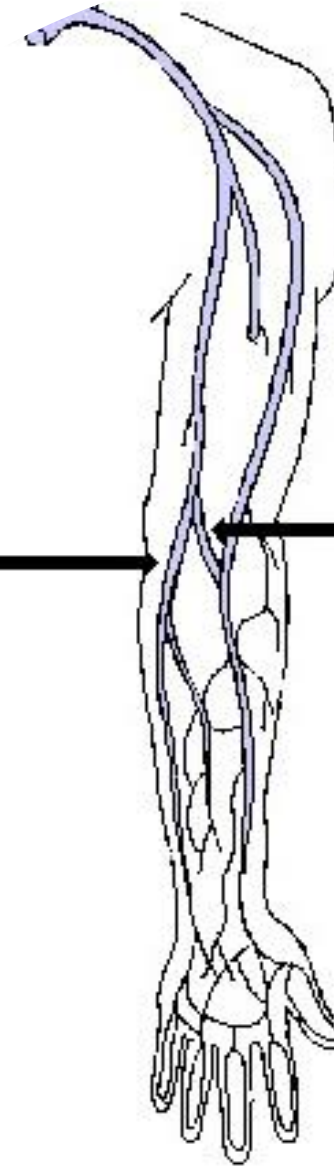
# IV ACCESS

Ultrasound is our friend!



Basilic Vein

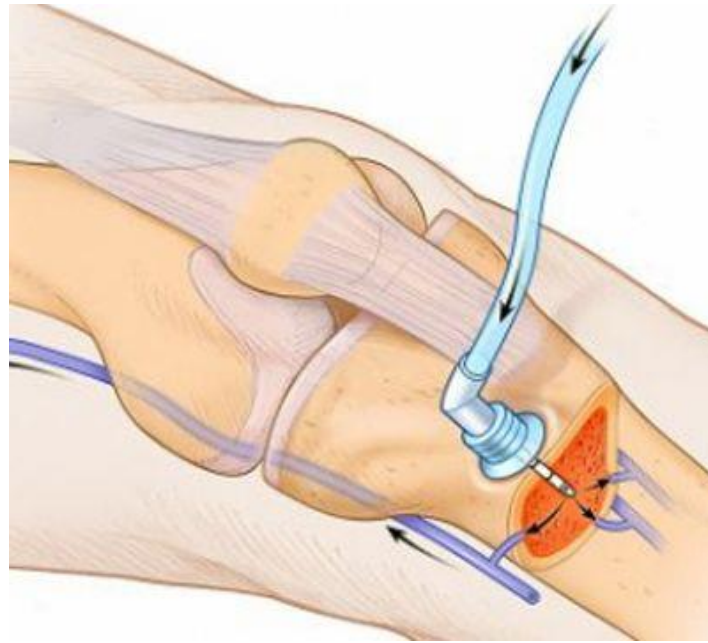
Brachial Vein





# IV ACCESS

## Intraosseous



Available: 45mm Needle Sets – for patients 40kg and greater



# IV ACCESS

## Look at the Hand!

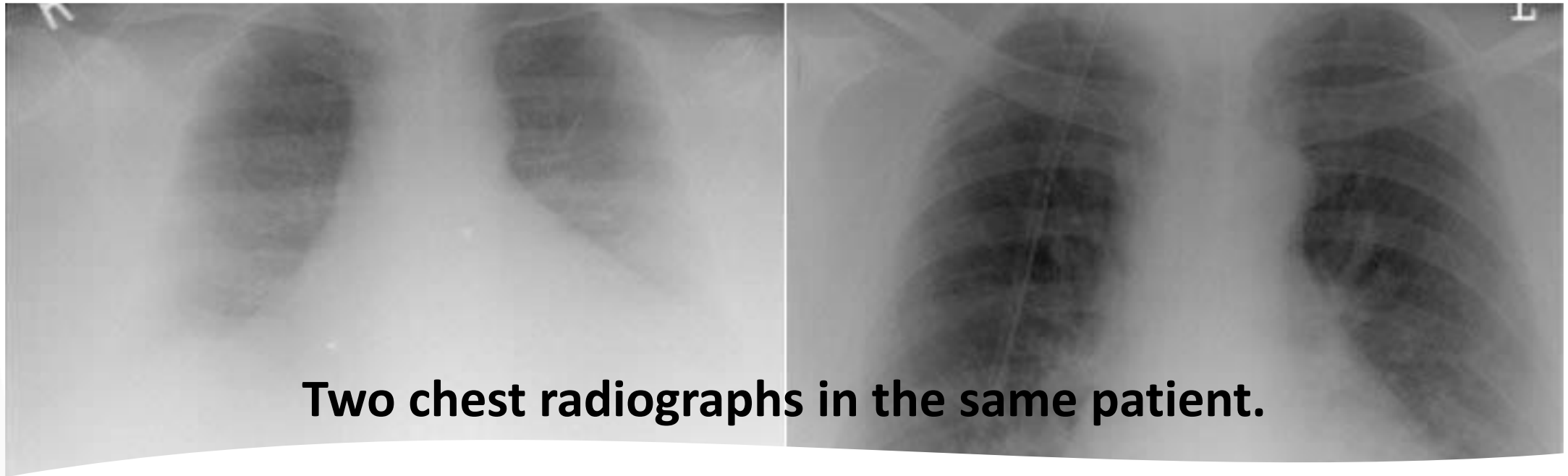


# IMAGING

“Obese patients in radiology XXL challenges!”







**Two chest radiographs in the same patient.**

- A. Fat tissue attenuates the x-ray beam, resulting in a limited quality image using standard methods of image acquisition.**
- B. Increasing the kVp and mAS and using an antiscatter grid can improve the image quality.**

**\*KvP = peak kilovoltage (maximum voltage applied across and x-ray tube). mAS = milliamp seconds (controls the “blackening” or density on the x-ray film)**



# IMAGING

## CT Scan

### TRADITIONAL CT

**\*Gantry diameter:  
70 cm (27.6 inches)**

**Table capacity:  
450 pounds**

### NEW GENERATION CT

**\*Gantry diameter:  
Up to 90 cm  
(35.3 inches)**

**Table capacity:  
up to 680 pounds**





# IMAGING

## Ultrasound<sup>24</sup>

- Sonography is the modality most affected by obesity, especially as the patient nears 250 pounds
- Fat distribution is a key variable
- Excessive subcutaneous fat typically yields poor image quality due to the attenuation of ultrasound beams as they try to reach intraperitoneal structures.
- Individuals with predominantly intraperitoneal fat, whose thin subcutaneous layer allows for easy penetration of ultrasound beams

# “The Grim Reaper” Death by Obesity





# OBESITY – IS IT THE ELEPHANT IN YOUR ED?



You Can't ignore ME Now!!!

So...



Any Questions?

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King Faisal Specialist Hospital & Research Centre  
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